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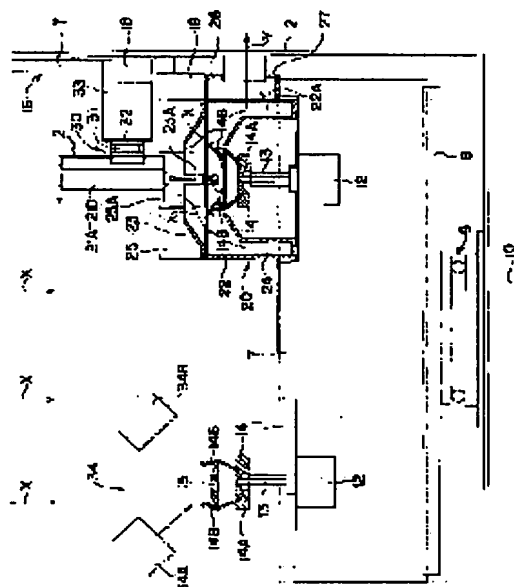
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## (54) LENS COATING APPARATUS FOR LENS OF SPECTACLES

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a lens coating apparatus for a lens of spectacles capable of continuously performing the work from the coating of a coating solution to the drying thereof by compact constitution.

**SOLUTION:** The lens coating apparatus consists of a pair of lens holders 14 reciprocating between a coating position and a curing position to hold a pair of lenses of spectacles while rotating them, a holding body 7 for holding a pair of the lens holders 14 in a rotatable manner and locating one of a pair of the lens holders at the coating position while locating other one of them at the curing position, a plurality of dispensers 21A-21D arranged at the coating position above the holding body 7 to coat the surfaces of the lenses 15 of the spectacles with the coating solution and a light irradiating means 34 arranged at the curing position above the holding body 7 to irradiate the coating solution applied to the surfaces of the lenses 15 of the spectacles with light to cure the same. This coating apparatus is provided in a clean room 1.



## LEGAL STATUS

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**CLAIMS**

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[Claim(s)]

[Claim 1] The lens holder of the pair for holding going between a spreading location and a hardening location, and rotating the spectacle lens of a pair, The supporter for locating one side of the lens holder of this pair in a spreading location, and locating another side of said lens holder in a hardening location, while holding the lens holder of said pair pivotable, In the upper part of said supporter And two or more dispensers which are arranged in said spreading location and apply a coating solution to the front face of said spectacle lens, Lens coating equipment the upper part of said supporter, and for the spectacle lenses characterized by establishing a beam-of-light exposure means to irradiate the beam of light for stiffening the coating solution which was arranged in said hardening location and applied to the front face of said spectacle lens, in a clean room.

[Claim 2] Lens coating equipment for spectacle lenses according to claim 1 characterized by said supporter being pivotable.

[Claim 3] Lens coating equipment for spectacle lenses according to claim 1 characterized by the ability of said supporter to reciprocate.

[Claim 4] Lens coating equipment for spectacle lenses given in any 1 term of claim 1 characterized by being prepared in said spreading location possible [ rise and fall ], and preparing the duct member for attracting the scattering liquid of said coating solution during rotation of said lens holder thru/or claim 3.

[Claim 5] Lens coating equipment for spectacle lenses given in any 1 term of claim 1 characterized by making reciprocation horizontally possible so that said two or more dispensers may be set to a spreading location thru/or claim 4.

[Claim 6] Lens coating equipment for spectacle lenses given in any 1 term of claim 1 characterized by forming said two or more dispensers possible [ rise and fall ] thru/or claim 5.

[Claim 7] Lens coating equipment for spectacle lenses given in any 1 term of claim 1 characterized by for said beam-of-light exposure means consisting of a UV irradiation means and an infrared exposure means, and irradiating a beam of light from across to said spectacle lens thru/or claim 6.

[Claim 8] Lens coating equipment for spectacle lenses according to claim 7 characterized by irradiating a beam of light and stiffening said coating solution, rotating said spectacle lens when said spectacle lens is in a hardening location.

[Claim 9] The lens holder of the pair for holding the spectacle lens of a pair rotating, Two or more dispensers which reciprocate in the upper part of the lens holder of a pair, and apply a coating solution to the front face of said spectacle lens, Lens coating equipment for spectacle lenses characterized by establishing a beam-of-light exposure means to irradiate the beam of light for stiffening the coating solution which reciprocated in the upper part of the lens holder of said pair, and was applied to the front face of said spectacle lens, in a clean room.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Field of the Invention]** This invention relates to amelioration of the lens coating equipment for spectacle lenses.

**[0002]**

**[Description of the Prior Art]** From the former, to the lens coating equipment for spectacle lenses The dispenser for applying a coating solution to a spectacle lens, The coater which has the lens holder held rotating a spectacle lens is formed. After applying a coating solution on the surface of a spectacle lens, making it rotate holding a spectacle lens, the spectacle lens with which this coating solution was applied is removed from a lens holder. The spectacle lens with which this coating solution was applied is carried to a dryer, it puts into a dryer, and what dries and stiffens a coating solution is known.

**[0003]**

**[Problem(s) to be Solved by the Invention]** However, with the lens coating equipment for these conventional spectacle lenses, since the coater which applies a coating solution to a spectacle lens, and the dryer for carrying out desiccation hardening of the coating solution are arranged in somewhere else, the whole room must be made into a clean room and there is a problem that a facility becomes large-sized.

**[0004]** Moreover, in performing coating of several layers to a spectacle lens, a spectacle lens must be gone, come back to and carried between a coater and a dryer, and there is also a possibility that a foreign matter may adhere to each coating film of the front face of a spectacle lens in the case of both-way carrying.

**[0005]** Although it is possible to perform a series of processes by the assembly line with a mass-production type thing, when it applies to the thing of item production, it is difficult to apply a mass-production type process to the location which whose big facility tooth space is needed while facility cost increases, and does not have allowances in tooth spaces, such as a glasses store.

**[0006]** In view of the above-mentioned situation, it succeeded in this invention, and it is to offer the lens coating equipment for spectacle lenses which is a compact configuration and can do the activity from spreading of a coating solution to desiccation continuously.

**[0007]**

**[Means for Solving the Problem]** The lens coating equipment for spectacle lenses according to claim 1 The lens holder of the pair for holding going between a spreading location and a hardening location, and rotating the spectacle lens of a pair, The supporter for locating one side of the lens holder of this pair in a spreading location, and locating another side of said lens holder in a hardening location, while holding the lens holder of said pair pivotable, In the upper part of said supporter And two or more dispensers which are arranged in said spreading location and apply a coating solution to the front face of said spectacle lens, It is characterized by establishing a beam-of-light exposure means to irradiate the beam of light for stiffening the coating solution which was the upper part of said supporter, and was arranged in said hardening location and applied to the front face of said spectacle lens, in a clean room.

**[0008]** The lens coating equipment for spectacle lenses according to claim 2 is characterized by said supporter being pivotable.

[0009] The lens coating equipment for spectacle lenses according to claim 3 is characterized by the ability of said supporter to reciprocate.

[0010] The lens coating equipment for spectacle lenses according to claim 4 is characterized by being prepared in said spreading location possible [ rise and fall ], and preparing the duct member for attracting the scattering liquid of said coating solution during rotation of said lens holder.

[0011] The lens coating equipment for spectacle lenses according to claim 5 is characterized by making reciprocation horizontally possible so that said two or more dispensers may be set to a spreading location.

[0012] The lens coating equipment for spectacle lenses according to claim 6 is characterized by forming said two or more dispensers possible [ rise and fall ].

[0013] Said beam-of-light exposure means consists of a UV irradiation means and an infrared exposure means, and the lens coating equipment for spectacle lenses according to claim 7 is characterized by irradiating a beam of light from across to said spectacle lens.

[0014] The lens coating equipment for spectacle lenses according to claim 8 is characterized by irradiating a beam of light and stiffening said coating solution, rotating said spectacle lens, when said spectacle lens is in a hardening location.

[0015] The lens coating equipment for spectacle lenses according to claim 9 The lens holder of the pair for holding the spectacle lens of a pair rotating, Two or more dispensers which reciprocate in the upper part of the lens holder of a pair, and apply a coating solution to the front face of said spectacle lens, It is characterized by establishing a beam-of-light exposure means to irradiate the beam of light for stiffening the coating solution which reciprocated in the upper part of the lens holder of said pair, and was applied to the front face of said spectacle lens, in a clean room.

[0016]

[Embodiment of the Invention] Drawing 1 is the top view showing the outline configuration of the lens coating equipment for spectacle lenses concerning this invention, 1 is a clean room and 2 is the configuration wall. A cleaning tank 3 and lens coating equipment 4 are formed in the clean room 1. The closing motion door 5 is formed in the configuration wall 2.

[0017] A cleaning tank 3 is formed near the closing motion door 5, and it is immersed in a cleaning tank 3 and it enables it to wash the spectacle lens as a coating object from the aperture 6 of the configuration wall 2. The cleaning tank 3 consists of solvent tub 3A and ridge agent tub 3B, and after dirt, such as a foreign matter, is removed by the cleaning tank 3, lens coating equipment 4 is equipped with a spectacle lens.

[0018] The lens coating equipment 4 has the supporter 7 of a rectangular parallelepiped configuration, as shown in drawing 2 and drawing 3 . This supporter 7 is laid in the installation plate 8, and the rotation transfer member 9 is formed in the lower part of the installation plate 8. The rotation drive of this rotation transfer member 9 is carried out in the direction of arrow-head A-A a core [ the center of rotation O shown in drawing 4 ] by the rotation driving sources 10, such as a motor.

[0019] The square-like openings 11 and 11 are formed in the top face at the supporter 7. The rotation driving sources 12 and 12, such as a motor, are formed in the center of the openings 11 and 11 at the lower part. 13 and 13 are the revolving shafts of the rotation driving sources 12 and 12.

[0020] The lens holders 14 and 14 are formed in the revolving shaft 13 removable. these lens holders 14 and 14 -- body section 14A and a line -- it consists of piece of spring 14B. the line -- a spectacle lens 15 is held according to the spring force removable at piece of spring 14B.

[0021] Here, although the case where one lens holder 14 is equipped with a concave lens, and the lens holder 14 of another side is equipped with the convex lens is shown, since it is a spectacle lens, originally it is equipped with a lens same type.

[0022] As shown in drawing 2 and drawing 3 , the lifting device 16 is being fixed to the configuration wall 2. This lifting device 16 consists of linear motors, 17 is a guide rail and 18 is a movable object. The adapter plate 19 is attached in this movable object 18. The duct member 20 and the dispenser adapter plate 21 are attached in this adapter plate 19.

[0023] The duct member 20 has the body section 22 of a rectangular parallelepiped configuration, as shown in drawing 2 and drawing 3 . The cone configuration member 23 is attached in the upper part of the body section 22 by means, such as welding. The tubed part material 24 is attached in the

interior of the body section 22 by means, such as welding.

[0024] The side attachment wall of the pair of the duct member 20 is prolonged up, and let them be the guidance wall boards 25 and 25. The auxiliary duct members 26 and 26 for path formation are being fixed to the side attachment wall of the pair by welding etc. The U character-like notching 27 is formed in these auxiliary duct members 26 and 26 for path formation, and it is outside open for free passage. Opening 22A which is open for free passage to the auxiliary duct members 26 and 26 for path formation is formed in the body section 22.

[0025] It is fixed to an adapter plate 19 through the bracket 28 shown in drawing 4, and the duct member 20 goes up and down in the vertical direction with a lifting device 16. The ducts 28A and 28A in a circle are formed in the location which corresponds to the configuration wall 2 with the U character-like notching 27 and 27. These ducts 28A and 28A in a circle are connected to the aspirator which omits illustration.

[0026] Four dispensers 21A-21D are being fixed to the dispenser adapter plate 21. The dispenser adapter plate 21 is attached in the movable object 31 of the horizontal reciprocator 30. Along with a movable rail 32, movable [ of this movable object 31 ] is carried out horizontally.

[0027] The horizontal reciprocator 30 is being fixed to the adapter plate 19 through the bracket 33. Dispenser 21A is for applying the coating solution for the 1st layer of for example, UV hardening mold, and Dispensers 21B-21D are for applying the coating solution the 2nd - for the 4th layer.

[0028] A beam-of-light exposure means 34 to irradiate the beam of light for stiffening the coating solution applied to the front face of a spectacle lens 15 is established above the supporter 7 of a hardening location. This beam-of-light exposure means 34 consists of UV irradiation means 34A and infrared exposure means 34B, and it is arranged so that a beam of light may be irradiated from across to a spectacle lens 15.

[0029] Next, the coating activity of a spectacle lens is explained.

[0030] The duct member 20 and Dispensers 21A-21D are in an upper part position in readiness first. In the clean room, as an arrow head X always shows, pure air shall flow toward the bottom from the top. Furthermore, one side of both the lens holder 14 shall be in a hardening location, another side of both the lens holder 14 shall be located in a spreading location, and the spectacle lens 15 shall not be set to both these lens holders 14 and 14.

[0031] The closing motion door 5 is opened, and a cleaning tank 3 performs a wash ridge for one side of the spectacle lens 15 which should be carried out coating, the lens holder 14 is removed from a revolving shaft 13, and it sets to this lens holder 14. A revolving shaft 13 is equipped with the lens holder 14 holding this spectacle lens 15.

[0032] Subsequently, the closing motion door 5 is shut, the control panel which omits illustration is operated, and a supporter 7 is half-rotated. Then, the lens holder 14 holding a spectacle lens 15 is located in a spreading location, and the lens holder 14 which does not hold the spectacle lens 15 is located in a hardening location. The spectacle lens [ finishing / washing ] 15 is set to the lens holder 14 which does not hold the spectacle lens 15 by the same work habits.

[0033] Thus, after setting the spectacle lenses 15 and 15 of a pair [ finishing / washing ] to the lens holders 14 and 14 of a pair, where the closing motion door 5 is shut, a lifting device 16 is driven and the duct member 20 and Dispensers 21A-21D are dropped. Then, the lens holder 14 is located in the interior of the body section 22 of the duct member 20. The U character configuration notching 27 and 27 and the ducts 28A and 28A in a circle of the duct auxiliary members 26 and 26 engage with coincidence, and the interior and the ducts 28A and 28A in a circle of the duct auxiliary members 26 and 26 are opened for free passage.

[0034] With the aspirator which omits illustration, as the suction force is working, therefore the suction force of the direction of arrow-head Y shows the body section 22 at drawing 2 and shows by the arrow head X, the flow of the air which goes to the duct auxiliary members 26 and 26 through opening 22A produces the ducts 28A and 28A in a circle.

[0035] The spreading nozzle of dispenser 21A is located in right above [ direct ] a spectacle lens 15 at coincidence. If the control panel which omits illustration is operated and motors 12 and 12 are made to drive, the lens holders 14 and 14 will rotate. The rotational frequency of the lens holder 14 in a spreading location is 3000rpm, the rotational frequency of the lens holder 14 in a hardening location is about 100 to 300 rpm, and the rotational frequency of the lens holder 14 at the time of

making it harden to the rotational frequency of the lens holder 14 in the case of spreading is considered as low-speed rotation.

[0036] Subsequently, if a control panel is operated and dispenser 21A is driven, a coating solution will be dropped at the front face of a spectacle lens 15.

[0037] A coating solution is uniformly applied to the front face of breadth and a spectacle lens 15 toward a periphery by the centrifugal force based on rotation of the lens holder 14 in a coating solution. With the mistake as a scattering solution in the case of dropping of the coating solution, it is drawn in by the duct member 20 through the interior of the body section 22, and is discharged outside through the duct auxiliary member 26 and in-a-circle duct 28A, and adhering to the front face of a spectacle lens 15 is prevented. The spreading time amount is about 10 seconds thru/or 20 seconds. The rotation suspends the lens holder 14 of a spreading location after spreading time amount progress. Even if it makes it stop, it is not necessary to stop the lens holder 14 of a hardening location.

[0038] Next, a control panel is operated, a lifting device 16 is driven, and the duct member 20 and Dispensers 21A-21D are raised. Subsequently, the lens holder 14 which omits illustration and which operates a control panel, drives a motor 10, is made to half-rotate a supporter 7, locates the lens holder 14 in a spreading location in a hardening location, and is in a hardening location is located in a spreading location. And operate a control panel, a lifting device 16 is made to drive again, the duct member 22 and Dispensers 21A-21D are dropped, and a coating solution is applied to the spectacle lens 15 in a spreading location by the same work habits.

[0039] Coincidence is made to turn on black light 34A, and ultraviolet rays are irradiated by the spectacle lens 15 with which the coating solution was applied. Since low-speed rotation of the spectacle lens 14 is carried out in the case of the UV irradiation, ultraviolet rays are uniformly irradiated by the front face of a spectacle lens 14. Moreover, since it is low-speed rotation, the thickness of a spectacle lens 14 is maintained by predetermined thickness. This UV irradiation time amount is about 1 minute. In addition, an after [ spreading time amount progress ] rotation halt of the spectacle lens 15 in a spreading location is carried out. It is because there is a possibility of becoming thinner than the thickness planned on the design when rotation is maintained more than this.

[0040] Thus, while applying a coating solution to the front face of one spectacle lens 15, the hardening activity of the coating solution applied to the spectacle lens 15 of another side is done, and the coating film of the 1st layer is formed in the spectacle lens 15 in a hardening location.

[0041] Subsequently, a motor 10 is driven, a supporter 7 is half-rotated, the spectacle lens 15 with which the coating film of the 1st layer was formed is located in a spreading location, and the spectacle lens 15 with which the non-hardened coating solution was applied is located in a hardening location.

[0042] And the control panel which omits illustration is operated and a reciprocator 30 is driven. By the drive of this reciprocator 30, dispenser 21B for applying the coating solution for the 2nd stratification is located right above a spreading location. In addition, notching 23A and 25A is formed in the cone configuration member 23 of the duct member 20, and the guidance wall board 25, respectively so that it may not become the obstacle of reciprocation of Dispensers 21A-21D.

[0043] Subsequently, a lifting device is driven and the duct member 20 and Dispensers 21A-21D are dropped. Next, motors 12 and 12 are driven and the rotation drive of the lens holders 14 and 14 is carried out. Then, dispenser 21B is driven, the coating solution for the 2nd stratification is dropped at the spectacle lens 15 in a hardening location, and the 2nd layer is applied to the front face of this spectacle lens 15. This spreading time amount of the 2nd layer is the same as the spreading time amount of the 1st layer. That it is the same takes after [ expedient ] also explaining the spreading time amount of the 3rd layer and the 4th layer mentioned later.

[0044] Ultraviolet rays are irradiated by the spectacle lens 15 which is in a hardening location during this 2nd-layer spreading, and the coating solution applied by this on the front face of the spectacle lens 15 in a hardening location is hardened.

[0045] Subsequently, a lifting device 16 is raised after UV irradiation time amount progress of the spectacle lens 15 in this hardening location, next a motor 10 is driven, a supporter 7 is half-rotated again, the spectacle lens [ finishing / non-hardened coating solution spreading ] 15 with which the

2nd layer was formed is located in a hardening location, and the spectacle lens [ finishing / hardening ] 15 with which the 1st layer was formed is located in a spreading location. And again, a lifting device 16 is driven, the duct member 20 and Dispensers 21A-21D are dropped, and the coating solution for the 2nd stratification is applied to the spectacle lens 15 after the 1st stratification by the same work habits.

[0046] On the other hand, infrared radiation is irradiated by infrared irradiation equipment 34B at the spectacle lens 15 with which the coating solution for the 2nd stratification was applied, and desiccation hardening of the coating solution is carried out.

[0047] Thus, the coating solution of the 2nd layer applied to the spectacle lens 15 of another side during the 2nd-layer spreading of a coating solution to one spectacle lens 15 is hardened.

[0048] It is carried out by work habits with the same said of the 3rd-layer spreading and hardening, the 4th-layer spreading, and hardening. Although there are what is formed to the 3rd layer, and a thing until it forms to the 4th layer in formation of the coating film of a spectacle lens 15, it explains as that with which the front face of a spectacle lens 15 is coated to the 4th layer.

[0049] Now, it shall be in a hardening location, a coating solution [ finishing / spreading to a spectacle lens 15 ] shall be hardened by infrared exposure, and it shall be in the condition that the coating solution of the 4th layer was applied to the spectacle lens 15 of another side.

[0050] here, a control panel is operated, the duct member 20 and Dispensers 21A-21D are raised, and, subsequently a supporter 7 is half-rotated -- making -- the 4th stratification -- finishing -- and the spectacle lens [ finishing / hardening ] 15 is located in a spreading location, the spectacle lens [ finishing / the 4th-layer coating solution spreading ] 15 is located in a hardening location, infrared radiation is irradiated, and the spectacle lens 15 is made to harden a coating solution [ finishing / spreading ] Thereby, temporary formation of the coating film to both spectacle lenses 15 is completed.

[0051] The closing motion door 5 is opened after irradiation time termination, and a spectacle lens 15 is removed from a revolving shaft 13 to the lens holder 14 and one. Subsequently, a supporter 7 is half-rotated, the spectacle lens 15 in a spreading location is located in a hardening location, and a spectacle lens 15 is removed from a revolving shaft 13 to the lens holder 14 and one.

[0052] Then, the lens holder 14 of this pair is put into the oven equipment which omits illustration, and is dried about about 10 minutes. Thereby, the coating film formed in spectacle lenses 15 and 15 is hardened completely.

[0053] The above spreading and a hardening activity are shown in the flow chart (S. one to S.19 reference) shown in drawing 5 .

[0054] Although it decided to do each spreading and a hardening activity by manual operation and the gestalt of implementation of this invention explained After setting spectacle lenses 15 and 15 to the lens holders 14 and 14 of a pair, respectively, henceforth, A series of activities to the 3rd layer or 4th-layer spreading and a hardening activity, i.e., the steps from S.3 to S.16, can be done on the configuration performed automatically by pushing a start button using a control device.

[0055] Moreover, although considered as the configuration which is made to half-rotate a supporter 7, sets one spectacle lens 15 to a spreading location, and sets the spectacle lens 15 of another side to a hardening location with the gestalt of implementation of this invention, it is good also as a configuration which a supporter 7 is made to reciprocate, sets one spectacle lens 15 to a spreading location, and sets the spectacle lens 15 of another side to a hardening location.

[0056] Furthermore, with the gestalt of implementation of this invention, when applying a coating solution to one side of the spectacle lenses 15 and 15 of a two-piece pair, it considered as the configuration which makes the spectacle lenses 15 and 15 of another side harden a coating solution [ finishing / spreading ], but in case a coating solution is applied to either of four spectacle lenses 15, it is good also as a configuration which makes remaining either of the three pieces harden a coating solution [ finishing / spreading ].

[0057] In addition, although considered as the configuration which is made to rotate the lens holder 14 and 14 side, and is made to go between a hardening location and a spreading location with the gestalt of implementation of this invention It is good also as a configuration to which make a location as it is maintain the lens holders 14 and 14, and the duct member 20, Dispensers 21A-21D, and the beam-of-light exposure means 34 are made to go and come back between one lens holder 14

and the lens holder 14 of another side.

[0058]

[Effect of the Invention] Since this invention was constituted as explained above, it can offer the lens coating equipment for spectacle lenses which is a compact configuration and can do the activity from spreading of a coating solution to desiccation continuously.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the top view showing the outline configuration of the lens coating equipment concerning this invention.

[Drawing 2] It is the side elevation in which carrying out the cross section of the important section of the lens coating equipment concerning this invention, and showing the configuration.

[Drawing 3] It is the sectional view in which carrying out the cross section of the important section of the lens coating equipment shown in drawing 2 , and showing the configuration.

[Drawing 4] It is the top view showing the important section configuration of the lens coating equipment shown in drawing 2 .

[Drawing 5] It is a flow chart for explaining spreading of the lens coating equipment of this invention, and a hardening activity.

[Description of Notations]

1 -- Clean room

7 -- Supporter

14 -- Lens holder

15 -- Spectacle lens

21A-21D -- Dispenser

34 -- Beam-of-light exposure means

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[Translation done.]

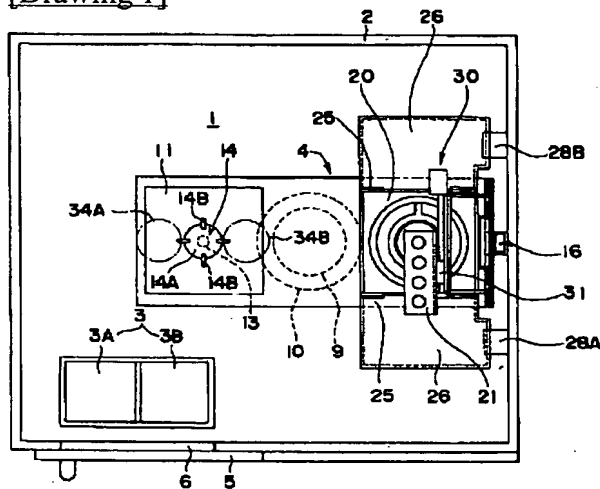
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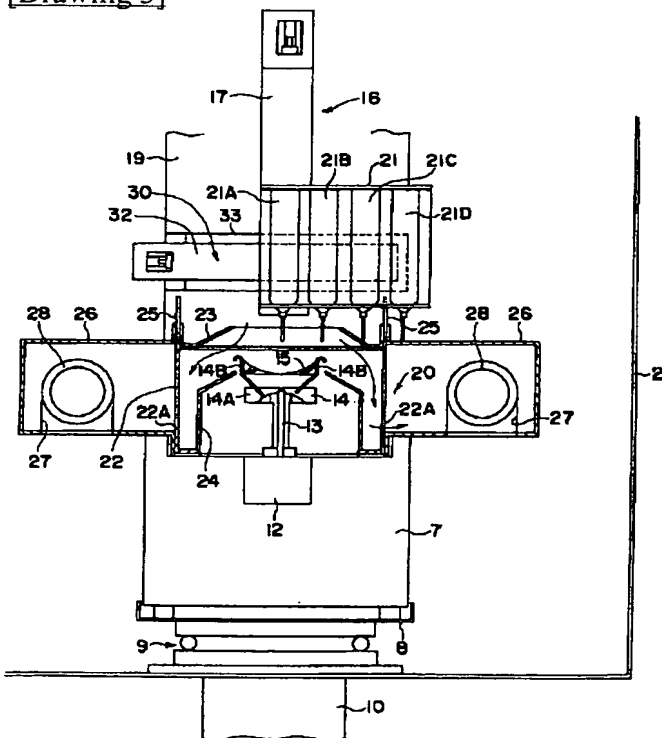
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## DRAWINGS

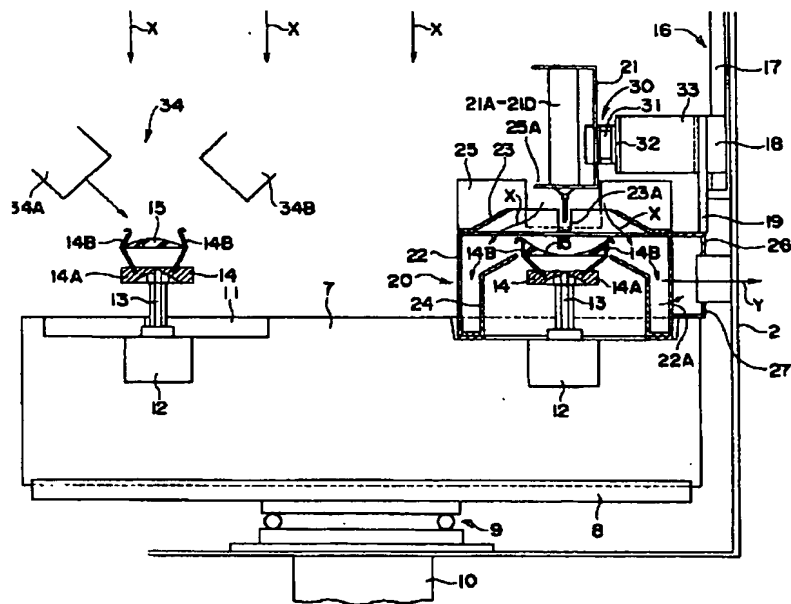
[Drawing 1]



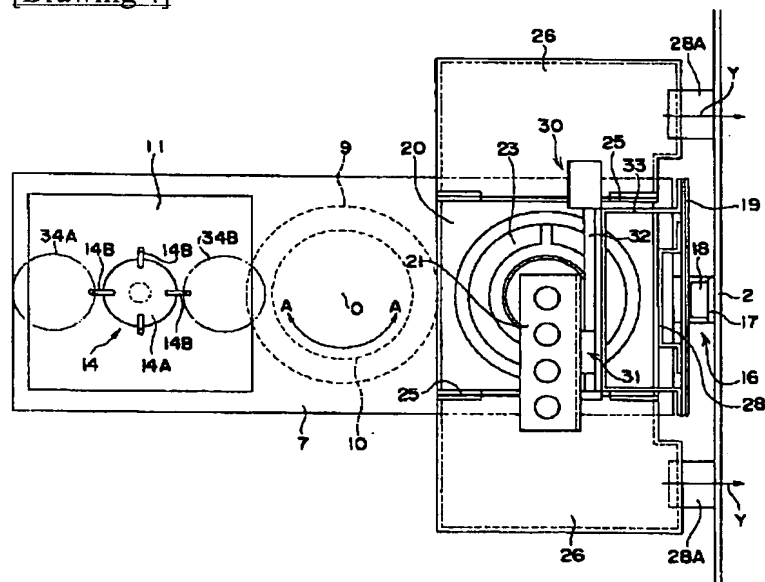
[Drawing 3]



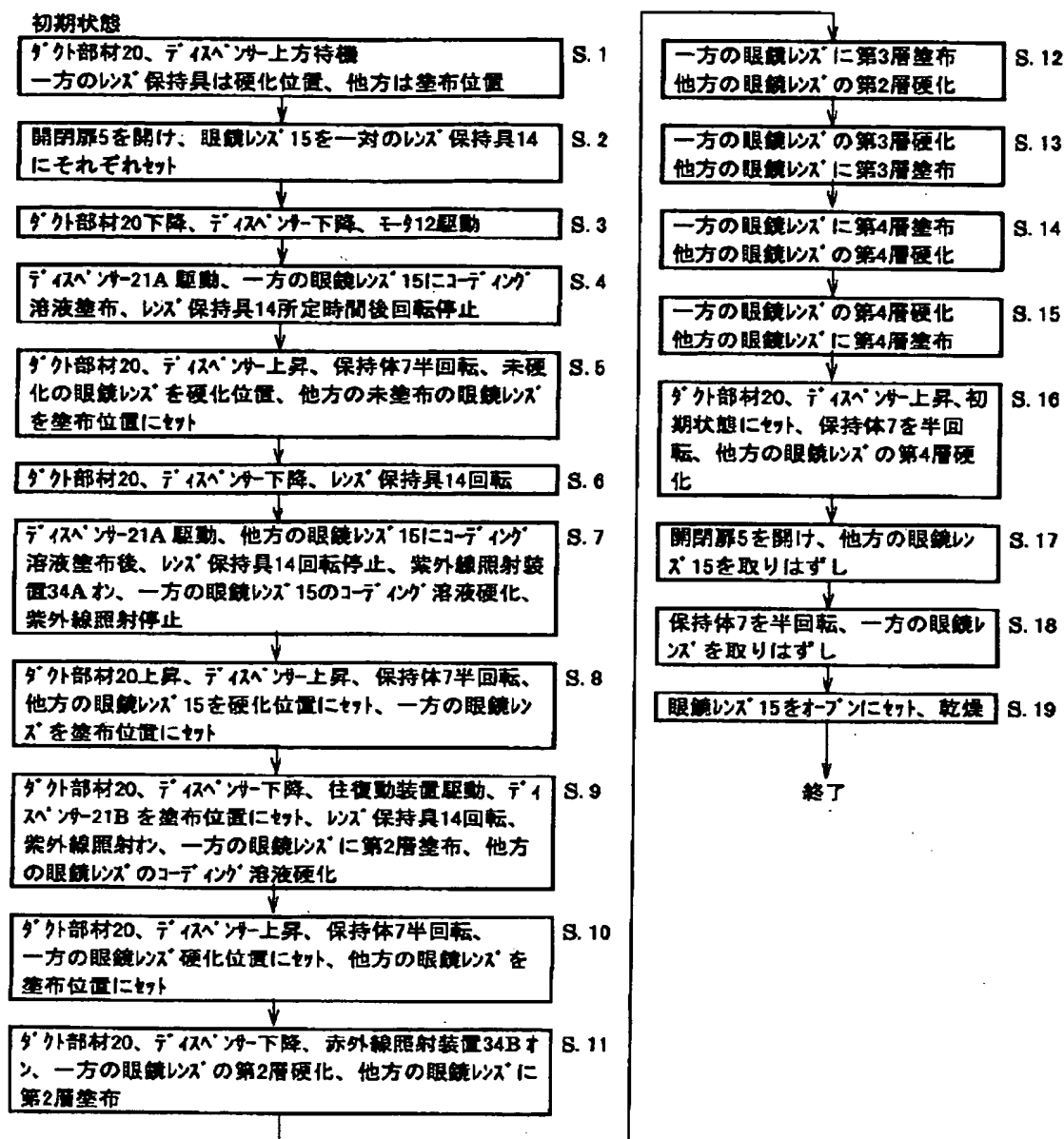
[Drawing 2]



[Drawing 4]



[Drawing 5]



[Translation done.]